Lapp, Susanne; Scheide, Joachim; Solveen, Ralph

Working Paper

Determinants of exports in the G7-countries

Kiel Working Papers, No. 707

Provided in cooperation with:
Institut für Weltwirtschaft (IfW)

Suggested citation: Lapp, Susanne; Scheide, Joachim; Solveen, Ralph (1995) : Determinants of exports in the G7-countries, Kiel Working Papers, No. 707, http://hdl.handle.net/10419/851

Kieler Arbeitspapiere
Kiel Working Papers

Kiel Working Paper No.707

DETERMINANTS OF EXPORTS IN THE G7-COUNTRIES

by

Susanne Lapp, Joachim Scheide and Ralph Solveen

Institut für Weltwirtschaft an der Universität Kiel
The Kiel Institute of World Economics

ISSN 0342 - 0787

The Kiel Institute of World Economics
Düsternbrooker Weg 120, D-24105 Kiel

Kiel Working Paper No.707

DETERMINANTS OF EXPORTS IN THE G7-COUNTRIES

by

Susanne Lapp, Joachim Scheide and Ralph Solveen

September 1995

ABSTRACT

Real effective exchange rates and economic activity in trading partner countries have a considerable impact on real exports of the G7-countries. Using an error-correction framework we find that the short-run and the long-run effects differ substantially between the countries. The relative importance of both influences is demonstrated in a simulation with standardized shocks. For five countries, the effects are more or less the same; in Japan, however, the exchange rate effect dominates the effect stemming from foreign economic activity, the opposite is true for France. Finally, exchange rate volatility does not systematically affect export growth in the majority of the countries.

JEL CLASSIFICATION: C22, F17

DETERMINANTS OF EXPORTS IN THE G7-COUNTRIES

The exchange rates of major currencies have changed considerably in the course of 1995. This affected the economic outlook because the export performance of countries with a revaluation should deteriorate while countries with a devaluation should experience a boost. An impact on economic policy could also be made out as several central banks lowered (raised) key interest rates in response to an increase (decrease) in the value of their currencies. This, in turn, should also influence the expansion of economic activity in the respective countries.

This paper addresses the question of how important changes in the real effective exchange rate are for real exports and thus for real GDP in the G7-countries. In addition to estimating the "price elasticity" of exports, the "income elasticity" — i.e. the response of exports to changes in economic activity in main trading partners — is calculated for each of the seven countries. The empirical analysis focuses on the short-term and the long-term effects in the context of an error-correction framework. As an extension of this analysis, a variable measuring the variability of nominal exchange rates is added to each model in order to test the hypothesis that exports are negatively affected by price volatility.

In the first section of the paper, the data and the definitions are summarized. Section II presents the method of estimation. The preliminary unit root tests for the variables under consideration are reported. Also, the results for the best model for each country are presented. A comparison of the size of the various effects is made. In Section III, we run shock simulations and interpret the results with a particular focus on the relative importance of disturbances to the exchange rate on

the one hand and to the economic activity abroad on the other. A summary of the main findings is given in the final section.

I. Data and Definitions[1]

The variable to be explained is the volume of exports of goods (EXP). The measure of the price competitiveness of exporters is the real effective exchange rate based on export unit values (ER), calculated by the International Monetary Fund (IMF 1995). It would have been desirable to use an exchange rate based on relative export prices instead since this is most relevant for the quantity variable under consideration; however, it is not available.[2] Alternatively, we also tested the real effective exchange rate based on relative wholesale prices; since they are partly industry selling prices and since roughly 80 percent of exports are manufactured goods, they appear to be a good proxy. However, our empirical results do not change substantially if this variable is used. For our purposes, the real effective exchange rate based on relative consumer prices is not a good alternative because of the large weight of non-traded goods. To approximate foreign economic activity (Y*), we used the weighted sum of industrial production in the ten most important trading partners of each country with the weights given by the average share in trade in the years 1989 to 1991.[3] On average, those ten countries account for about 70 percent of exports. The flexibility of exporters to react to changes in exchange rates and foreign demand may depend on domestic condi-

---

1 See also Appendix A for a complete description of all data and sources.

2 Export unit values come close to export prices but they have several drawbacks; for example, they may already incorporate the adjustment of exporters to exchange rate changes.

3 This caused some problems in the case of Japan since quarterly data are not available on China, Hongkong and Thailand. We therefore used the industrial production of the three countries next in line, i.e. Canada, France and the Netherlands.

tions as well. To account for this effect, the rate of capacity utilization (CAP) in the home economy is considered as well. All these variables are included in the testing equation. After the best model — according to criteria described below — is found, we add a variable representing the volatility of exchange rates. As a rough measure, we use the standard deviation of the quarterly changes in the nominal effective exchange rate over the previous four quarters for each country. Finally, a trend variable is included to capture the secular increase of international trade. For all countries, dummy variables must be included to account for special factors in the movement of — the commonly very volatile series of — exports.

II. Methods of Estimation

For the choice of the correct specification of a model it is necessary first to analyze the degree of integration of each variable. Table A1 (Appendix B) presents the results for the levels and first differences of the series used. For each country, practically all variables appear to be stationary in first differences. The exceptions are the real effective exchange rate (ER) in the case of the United Kingdom and the rate of capacity utilization (CAP) in Canada. As both seem to be ambiguous cases — i.e. a unit root is not strongly rejected — we proceed by assuming that these series are integrated of order one just as the same variables for all other countries.

Cointegration between the variables is tested by using the method proposed by Kremers et al. (1992). Instead of the often used residual-based tests — e.g. Engle, Granger (1987) — an error-correction model of the following type is estimated for each country:

$$[1] \quad \Delta EXP_t = c + \mu \cdot t + \alpha_1 \cdot EXP_{t-1} + \alpha_2 \cdot ER_{t-1} + \alpha_3 \cdot Y^*_{t-1} + \alpha_4 \cdot CAP_{t-1} + \sum_{i=1}^{5} \beta_i \cdot \Delta EXP_{t-i} + \sum_{i=0}^{5} \gamma_i \cdot \Delta ER_{t-i} + \sum_{i=0}^{5} \delta_i \cdot \Delta Y^*_{t-i} + \sum_{i=0}^{5} \lambda_i \cdot \Delta CAP_{t-i} + u_t$$

Equation [1] is just a different way of writing the commonly used error-correction model of the form

$$[1'] \quad \Delta EXP_t = c + \alpha_1 \cdot \left(EXP_{t-1} + \frac{\mu}{\alpha_1} \cdot t + \frac{\alpha_2}{\alpha_1} \cdot ER_{t-1} + \frac{\alpha_3}{\alpha_1} \cdot Y^*_{t-1} + \frac{\alpha_4}{\alpha_1} \cdot CAP_{t-1} \right) + \sum_{i=1}^{5} \beta_i \cdot \Delta EXP_{t-i} + \sum_{i=0}^{5} \gamma_i \cdot \Delta ER_{t-i} + \sum_{i=0}^{5} \delta_i \cdot \Delta Y^*_{t-i} + \sum_{i=0}^{5} \lambda_i \cdot \Delta CAP_{t-i} + u_t$$

In equation [1], the t-statistic of the coefficient α_1 determines whether cointegration between the variables is present ($H_o: \alpha_1 = 0$). As the usual distributions do not apply, the common critical values of the t-statistics cannot be used. Instead, the critical values for these tests are reported in Banerjee et al. (1992). Furthermore, lags up to five quarters are considered in the first estimation. They are reduced by the method of „general to simple" (Gilbert, 1986), i.e. all lags which are not significant at the 90 %-confidence level are dropped one by one until the best model is found.

Table 1 — Diagnostics for the Final Models [1]

	USA	Japan	Germany	France	Italy	United Kingdom	Canada
R^2	0.71	0.71	0.66	0.63	0.80	0.80	0.81
Standard error of the estimate	0.02	0.02	0.02	0.01	0.05	0.02	0.02
Test for autocorrelation of the residuals							
LM-test for 1st order autocorrelation (χ^2-distributed)	1.95	0.13	0.49	1.15	0.56	0.66	0.67
	(0.16)	(0.72)	(0.48)	(0.28)	(0.46)	(0.42)	(0.41)
LM-test for 4th order autocorrelation (χ^2-distributed)	6.25	0.67	2.67	3.47	1.73	6.85	5.40
	(0.18)	(0.96)	(0.62)	(0.48)	(0.79)	(0.14)	(0.25)
Test for heteroscedasticity							
ARCH-test (χ^2-distributed)	0.07	0.03	0.58	0.16	0.84	0.00	0.32
	(0.79)	(0.86)	(0.45)	(0.69)	(0.36)	(0.95)	(0.57)
LR-test (χ^2-distributed)	–5.23	2.08	0.60	1.11	2.67	0.02	–5.31
	(1.00)	(0.15)	(0.44)	(0.29)	(0.10)	(0.89)	(1.00)
Test for parameter stability							
Chow-test (mid of sample, F-distributed)	0.61	1.00	1.05	1.03	1.10	0.93	0.61
	(0.81)	(0.47)	(0.42)	(0.44)	(0.39)	(0.53)	(0.87)
Test for normality of the residuals							
Jarque-Bera-test (χ^2-distributed)	0.07	0.95	0.70	0.42	1.08	0.90	0.81
	(0.97)	(0.62)	(0.71)	(0.81)	(0.58)	(0.64)	(0.67)

[1] Numbers in parantheses are significance levels.

Table 2 — Estimated Coefficients of the Error-Correction Models Based on Equation [1]

	USA	Japan	Germany	France	Italy	United Kingdom	Canada
constant	1.37 (5.48)	2.04 (5.54)	3.54 (5.03)	1.46 (2.49)	6.17 (5.90)	2.84 (5.14)	1.83 (4.16)
EXP(−1)[1]	−0.13 (−4.99**)	−0.20 (−5.74**)	−0.42 (−4.40*)	−0.23 (−4.73**)	−0.73 (−7.91**)	−0.49 (−5.00**)	−0.28 (−4.88**)
trend	—	—	0.001 (1.89)	—	0.003 (4.61)	0.003 (5.51)	0.004 (4.75)
Y*(−1)	0.31 (6.43)	0.34 (5.42)	0.61 (4.35)	0.49 (5.08)	1.07 (4.93)	0.26 (2.18)	—
ER(−1)	−0.16 (4.91)	−0.24 (−4.71)	−0.36 (−4.27)	−0.08 (0.91)	−0.64 (−4.13)	−0.17 (3.85)	−0.16 (−2.17)
CAP(−1)	—	−0.27 (−3.13)	—	—	—	—	—
ΔEXP(−1)	−0.20 (−2.44)	—	−0.21 (−2.43)	—	—	—	−0.51 (−5.72)
ΔEXP(−2)	—	0.19 (2.45)	—	−0.21 (−2.28)	—	—	−0.17 (−2.01)
ΔEXP(−3)	—	—	—	—	—	—	—
ΔEXP(−4)	−0.22 (−2.85)	—	—	−0.26 (−2.99)	—	−0.22 (−3.23)	−0.24 (−2.85)
ΔEXP(−5)	—	—	—	—	—	−0.13 (−1.83)	−0.18 (−2.20)
ΔY*	0.52 (2.03)	—	1.46 (5.59)	1.17 (6.34)	2.35 (6.16)	—	1.65 (7.27)
ΔY*(−1)	0.62 (2.15)	—	—	—	—	—	0.85 (2.91)
ΔY*(−2)	—	—	—	—	—	0.85 (3.49)	—
ΔY*(−3)	—	−0.66 (−2.76)	—	—	—	—	0.54 (2.60)
ΔY*(−4)	—	−0.46 (−2.15)	—	—	—	—	0.78 (3.01)

Table 2 continued

	USA	Japan	Germany	France	Italy	United Kingdom	Canada
ΔY*(–5)	—	0.59 (2.48)	—	—	—	—	0.82 (3.43)
ΔER	—	—	—	—	–0.80 (–4.16)	—	–0.42 (2.99)
ΔER(–1)	—	—	—	–0.52 (–3.47)	—	—	—
ΔER(–2)	—	—	—	—	—	0.15 (2.50)	—
ΔER(–3)	—	—	—	–0.25 (–1.87)	—	—	—
ΔER(–4)	—	—	—	—	—	—	—
ΔER(–5)	—	—	—	–0.49 (–3.71)	—	—	—
ΔCAP	—	—	—	—	—	—	—
ΔCAP(–1)	—	—	—	—	—	—	—
ΔCAP(–2)	—	—	—	—	—	—	—
ΔCAP(–3)	—	—	—	—	–0.53 (–2.93)	—	—
ΔCAP(–4)	—	—	—	—	—	—	—
ΔCAP(–5)	—	—	–0.39 (–2.49)	—	—	—	—
Number of dummies	3	5	2	3	5	3	5

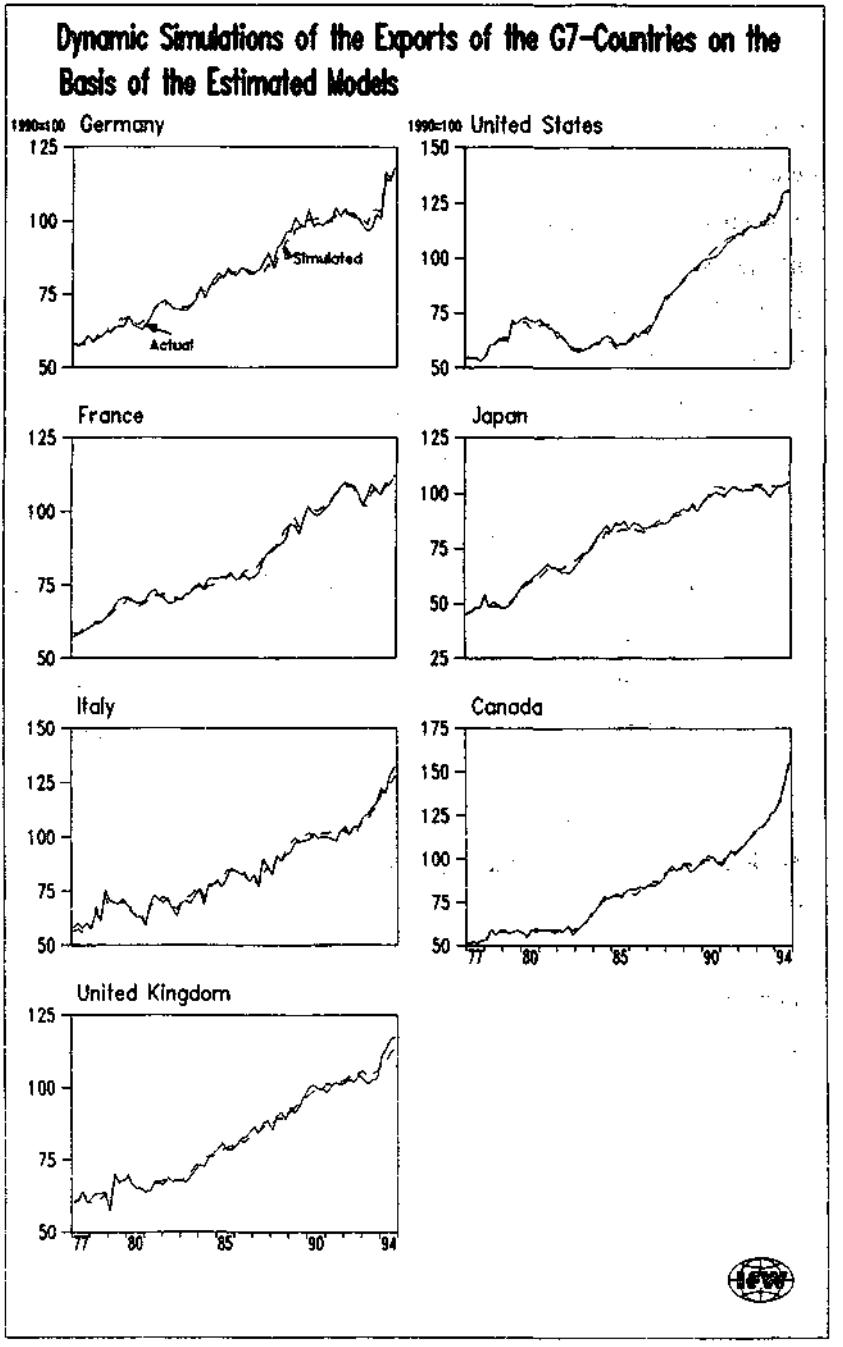
[1]The t-statistic of the coefficient is used to test for cointegration. The null-hypothesis of no cointegration as rejected at the 1% and 5% significance level (**and *), respectively, based on the critical values from Banerjee et al. (1992).

The results are presented in Tables 1 and 2. The test statistics for the seven equations all reveal that the specifications are not subject to serious errors: There appears to be no evidence of autocorrelation, heteroscedasticity, parameter instability or non-normality (Table 1). Cointegration is obviously present given the high values of the t-statistic for the level of lagged exports (Table 2): the hypothesis of no cointegration is rejected at the 1 % significance level for six countries and at the 5 % level for Germany. In general, cointegration exists between real exports, the real effective exchange rate and the measure of economic activity abroad. The latter variable, however, does not appear in the case of Canada. Domestic capacity utilization is important in the long run only for Japan. As to the short-run effect, domestic conditions have a significant impact only in Germany and in Italy, i.e. if the rate of capacity utilization (CAP) increases, export growth declines as firms face production constraints.

III. Interpretation of the Results

The quality of the models can be demonstrated in the dynamic simulations (Figure 1) in which the endogenous variable is derived within the equation and then used to calculate the value for the next period and so on. The ups and downs as well as the trend behavior of the volume of exports are traced quite well by the estimated equations. The size of the respective elasticities, i.e. the reaction of exports after a permanent devaluation and a permanent increase in foreign economic activity by one percent is summarized in Table 3. As exports in some cases react without a lag to the respective changes, the short-run response is defined as the change after two quarters. The long-term effect is calculated from the coefficients

Figure 1


Dynamic Simulations of the Exports of the G7-Countries on the Basis of the Estimated Models
1990=100 Germany
Simulated
Actual
1990=100 United States
France
Japan
Italy
Canada
United Kingdom
77
80
85
90
94

reported in Table 2; it is equal to $-\alpha_2 / \alpha_1$ in the case of ER and to $-\alpha_3 / \alpha_1$ in the case of Y*.

With regard to the effect of changes in the real exchange rate, there are large differences between the countries. These may depend on the type of export goods (consumption or investment). The size of the elasticity in the short run may also be affected by the time of delivery; if it is long for a large number of goods — as is the case for Germany (Döpke and Fischer, 1994) —, the response of exports is fairly low. Furthermore, the behavior of exporters is important, i.e. whether in the case of a devaluation they just increase their profit margins or try to expand their market share abroad. Finally, the dependence on exchange rate movements can be reduced in the long run if firms change their assortment of goods according to changes in demand conditions. The results show that Italian exporters respond very quickly to an increase of their competitiveness, whereas in the case of the United Kingdom, the effect of exchange rate variations is very low in the short run. These results are very much in line with the observation that after the respective devaluations since 1992, Italian exports were booming whereas British exports were increasing only moderately. For the long-run elasticity, substantial differences between the countries emerge as well. Here, the high levels for the United States and for Japan stand out, while in the United Kingdom the effect is again very small.[4]

The importance of exchange rate changes for economic activity[5] depends also on the openness of an economy. If the export share is taken as a measure (Table 3),

---

[4] Bailey et al. (1986) also analyzed the respective elasticities, though using a different method. In general, their results are similar to the ones reported here.

[5] The reasoning here concentrates on the direct effects on exports. Of course, exchange rate changes have an influence on other demand components as well; for example, consumption and investment will be negatively affected by a real depreciation.

Table 3 — On the Importance of Exchange Rates and Foreign Economic Activity for the Exports of G7–Countries

	Export share[a]	Change in real exports (p.c.) following a one percent real effective depreciation		Change in real exports (p.c.) following a one percent increase in foreign eocnomic activity	
		after 2 quarters	long run	after 2 quarters	long run
United States	7.6	0.27	1.21	1.26	2.33
Japan	8.7	0.43	1.19	0.61	1.71
Canada	19.0	0.31	0.57	0.94	—
Germany	20.7	0.50	0.86	1.35	1.45
France	17.4	0.55	0.35	1.31	2.13
Italy	15.5	0.87	0.88	1.52	1.46
United Kingdom	20.2	0.11	0.35	1.24	0.33

[a]Relation between exports of goods and nominal GDP in 1994 (Italy: 1993).

it becomes obvious that a one-percent change in the exchange rate is less important for Japan than, say, for Germany because the German economy is much more dependent on exports.

The same applies, of course, to the relevance of economic activity abroad. A good performance in trading partners matters more for exports and the home economy if the export share is high. Also, the average growth rate in those countries matters. For example, Japanese exporters are in a relatively good position since the imports of China and of economies in Southeast Asia — their main trading partners — grow about twice as fast as those of most industrial countries. For practically all countries, the response of exports to the growth in export markets appears to be much larger than to the exchange rate (Table 3): If industrial production increases by one percent in the main trading partners, exports usually rise by more than one percent after two quarters, the exceptions are Japan and Canada. The differences between the countries become even bigger in the long run.[6]

It appears from the size of the elasticities that exports are more affected by the performance of economic activity abroad than by changes in real exchange rates. However, a one-percent change in both variables — as implied in the numbers presented in Table 3 — is not a typical one of the estimation period. For all countries, the deviations from the respective trend were roughly twice as high for the real effective exchange rate than for industrial production abroad. Their relative

---

[6] As an exception, the value for Canada is actually zero as the level of foreign economic activity is not included in the final model because of the wrong sign (i.e. negative) of the respective coefficient. This result is quite surprising; it implies that the adjustment process for this country is completely described by the short-run coefficients. As a caveat, however, the long-run responses should not be taken at face value because literally they imply the response to a permanent deviation of the respective variable from trend.

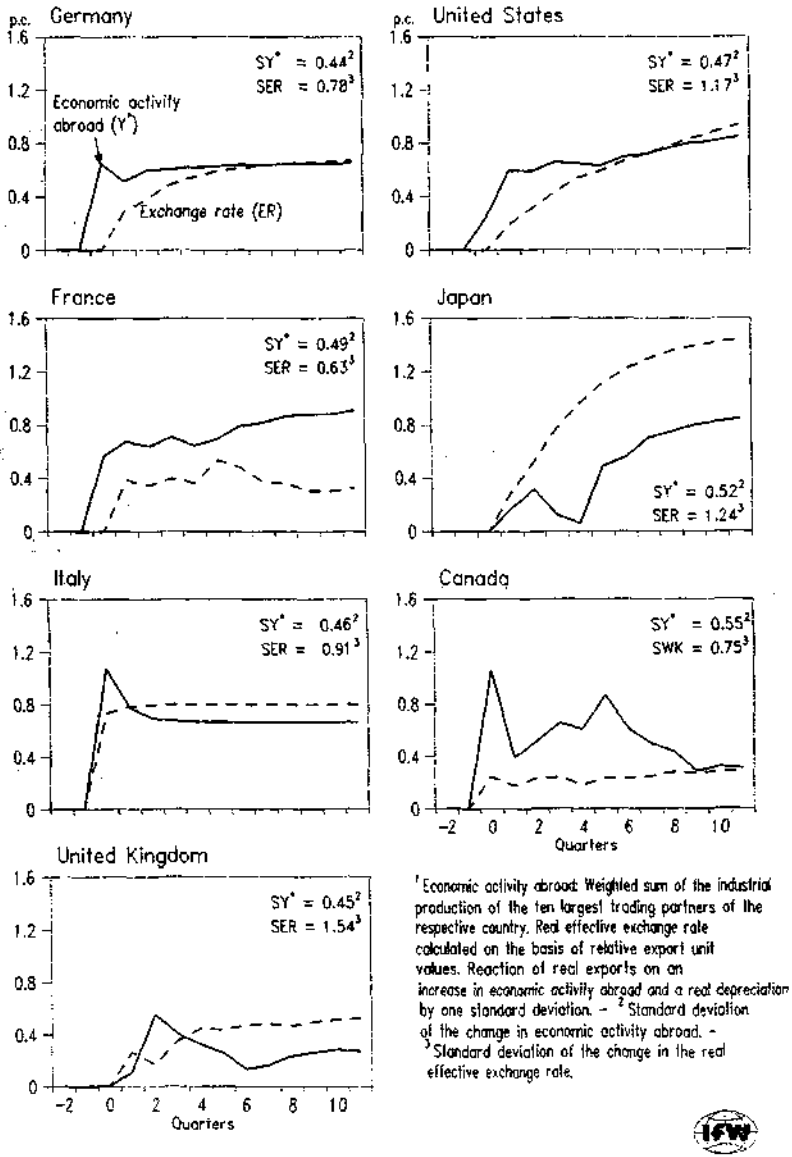
importance should therefore be tested by assuming a "typical" change, i.e. a deviation from trend equivalent to one standard deviation during the estimation period. Figure 2 shows the dynamics of the adjustment to a permanent change in both variables. In most cases, the response of exports to changes in Y* is stronger and more rapid, sometimes even occurring during the period of the shock. The major exception is Japan where the effect of the exchange rate change dominates already in the short run. Over longer periods, the effects are more or less the same for Germany, Italy, the United Kingdom and the United States, whereas the other countries show more persistent differences. France is the only country where changes in foreign economic activity dominate throughout, whereas the opposite is true for Japan.

As a general result, the simulations show that the importance of exchange rate changes for exports is often exaggerated in the public discussion. To be sure, real exchange rates do have an impact on market shares. As an example, the United States has experienced a substantial increase during the past ten years due to the decline in real value of the dollar while Japanese exporters lost market shares as the yen appreciated strongly in nominal and in real terms. But the path of exports in general relies heavily on the growth of world markets, i.e. exports will expand if the world economy expands.

Also it seems that the volatility of exchange rates itself is not relevant for the dynamics of exports. Using the estimated models reported in Table 2, we added a measure of the exchange rate variability (standard deviation of the quarterly changes in nominal effective exchange rates over the past year) with lags running form zero to five. The hypothesis that exchange rate volatility dampens export

Figure 2

Reaction of Real Exports of Large Industrial Countries to Changes in Economic Activity Abroad and the Real Effective Exchange Rate[1]



[1] Economic activity abroad: Weighted sum of the industrial production of the ten largest trading partners of the respective country. Real effective exchange rate calculated on the basis of relative export unit values. Reaction of real exports on an increase in economic activity abroad and a real depreciation by one standard deviation. – [2] Standard deviation of the change in economic activity abroad. – [3] Standard deviation of the change in the real effective exchange rate.

growth could be rejected for six countries[7]; only in Germany, the variability has a significant negative impact. These findings, too, support the notion that the importance of exchange rate changes or their variability is smaller than often believed by observers.

IV. Summary and Conclusions

Real effective exchange rates and foreign economic activity have a significant impact on exports of the G7-countries. Using an error-correction formulation, we find that this effect materializes — with minor exceptions — in the short run as well as in the long run; the respective elasticities differ, however, substantially between countries. The elasticity of exports with respect to economic activity in trading partners seems to be bigger than the elasticity with respect to the exchange rate. But if the shocks are normalized, it appears that the total impact is more or less the same for five countries although with different paths of adjustment. Exchange rates are more important in Japan and relatively less in France. Additionally, the hypothesis that exchange rate volatility has a negative impact on exports is rejected for all countries but Germany.

The size of the estimated elasticites and the differences between countries are difficult to interpret. There does not seem to be a single explanation such as the composition of export goods, the behavior of exporters, the terms of delivery etc. Also, the size of the exchange rate elasticity — and therefore also the elasticity regarding foreign economic activity — differs with the chosen definition. As an

---

[7] Because of the negative finding — in fact, some coefficients were significant but had the wrong sign —, the results are not reported here. Bailey et al. (1986) arrive at a similar conclusion.

example, if the real effective exchange rate on the basis of consumer prices is used instead, the respective elasticity goes down and the relative importance of economic activity in trading partners increases.

Bibliography

Bailey, M.J., G.S. Tavlas, and M. Ulan (1986). Exchange-Rate Variability and Trade Performance: Evidence for the Big Seven Industrial Countries. *Weltwirtschaftliches Archiv*, 122: 466–477.

Banerjee, A., J.J. Dolado, and R. Mestre (1992). On Some Simple Tests for Cointegration: The Cost of Simplicity. *Discussion Paper of the Institute of Economics at Aarhus University.*

Directorate General of Budget, Accounting and Statistics, Executive Yuan, Republic of China (1995). Quarterly National Economic Trends Taiwan Area.

Döpke, J., and M. Fischer (1994). Was bestimmt die westdeutschen Exporte? *Die Weltwirtschaft*: 54–66.

Engle, R.F., C.W.J. Granger (1987). Co-Integration and Error-Correction: Representation, Estimation, and Testing. *Econometrica*, 55: 251–276

Gilbert, C.L. (1986). Professor Hendry's Econometric Methodology. *Oxford Bulletin of Economics and Statistics*, 48: 283–307.

IMF (1995). International Financial Statistics. Washington, D.C.

Kremers, J.J.M., N.R. Ericsson, and J.J. Dolado (1992). The Power of Cointegration Tests. *Oxford Bulletin of Economics and Statistics*, 54: 325–348.

McKinnon, J.G. (1990). Critical Values for Cointegration Tests. *UCSD Economics Discussion Paper*: 90–4.

OECD (1995a). Main Economic Indicators. Paris.

– (1995b). Foreign Trade Statistics. Paris.

Appendix A:

Data Sources and Methods of Calculation:

Real exports (EXP):	Series „Volume of Exports", IMF International Financial Statistics (IMF 1995), series number *72. Seasonal adjustment with Census-X 11 method.
Real effective exchange rate (ER):	Series „Real effective exchange rate based on relative export unit values", IMF International Financial Statistics, series number *74ey.110.
Economic activity abroad (Y*):	Weighted sum of the industrial production indices of the ten largest trading partners of the respective country. The weight of a country is equal to its share in total exports of the respective country (average of the period 1989–1991), calculated on the basis of the OECD Foreign Trade Statistics (OECD 1995b). Series of industrial production — with the exception of Taiwan, South Korea and Singapore — are taken from the OECD Main Economic Indicators (OECD 1995a). Data for Taiwan are taken from the „Quarterly National Economic Trends Taiwan Area, The Republic of China" (Directorate General of Budget 1995), data for South Korea and Singapore are taken from the IMF International Financial Statistics and are seasonally adjusted by using the Census-X 11 method.
Domestic capacity utilisation (CAP):	Normal capacity utilisation in manufacturing is calculated by using a Hodrick-Prescott-Filter (λ=1600). Series for industrial production are taken from the OECD Main Economic Indicators.
Exchange rate variability (VAR):	Standard deviation of quarterly changes in nominal effective exchange rates over the past four quarters. Series „nominal effective exchange rate" are taken from IMF International Financial Statistics, series number *nec.

Appendix B:

Table A1 — Unit Root Tests[1]

Variable[2]	ADF1	ADF2	ADF3	ADF4	ADF5	Degree of Integration
			United States			
EXP	−0.90[3]	−1.09	−1.22	−1.01	−1.44	
ΔEXP	−4.50**[3]	−3.40*	−3.62**	−2.43	−2.04	I (1)
Y*	−2.54[3]	−3.03	−2.72	−2.78	−2.49	
ΔY*	−3.44*[3]	−3.66**	−3.38*	−3.58**	−3.78**	I (1)
ER	−1.32[3]	−1.48	−1.61	−1.61	−1.44	
ΔER	−4.54**[3]	−3.68**	−3.34*	−3.44*	−3.01*	I (1)
CAP	−3.31[3]	−3.00	−3.78*	−3.23	−2.88	
ΔCAP	−5.43**[3]	−3.94**	−4.43**	−4.60**	−3.65**	I (1)
			Japan			
EXP	−1.83	−2.89[3]	−2.41	−2.12	−1.91	
ΔEXP	−4.81**[3]	−4.13**	−4.07**	−3.95**	−3.47*	I (1)
Y*	−1.51	−1.98[3]	−1.85	−2.15	−1.54	
ΔY*	−3.99**[3]	−3.88**	−3.20*	−3.98**	−3.26*	I (1)
ER	−1.72[3]	−1.62	−1.79	−1.54	−1.18	
ΔER	−5.13**[3]	−4.23**	−4.13**	−4.16**	−4.76**	I (1)
CAP	−2.71[3]	−3.20	−3.09	−2.84	−2.40	
ΔCAP	−3.97**[3]	−3.93**	−4.02**	−4.30**	−2.97*	I (1)
			Germany			
EXP	−2.59[3]	−3.17	−3.41	−3.41	−2.76	
ΔEXP	−6.02**[3]	−4.64**	−4.36**	−4.94**	−4.73**	I (1)
Y*	−1.89	−2.42[3]	−2.45	−1.91	−2.23	
ΔY*	−4.03**[3]	−3.76**	−4.45**	−3.69**	−3.50*	I (1)
ER	−2.23[3]	−2.21	−2.62	−3.12	−2.67	
ΔER	−5.89**	−4.28**	−3.45*[3]	−3.86**	−4.60**	I (1)
CAP	−2.66	−2.78	−3.55*[3]	−3.44	−3.27	
ΔCAP	−5.72**[3]	−3.88**	−3.89**	−3.95**	−3.54**	I (1)

Table A1 (continued)

Variable[2]	ADF1	ADF2	ADF3	ADF4	ADF5	Degree of Integration
			France			
EXP	−2.20[1]	−1.88	−2.06	−1.86	−2.08	
ΔEXP	−6.89**[1]	−4.87**	−4.75**	−3.82**	−3.90**	I (1)
Y*	−1.91[1]	−2.25	−2.40	−2.02	−2.14	
ΔY*	−4.37**[1]	−3.80**	−4.17**	−3.77**	−3.37*	I (1)
ER	−2.00[1]	−1.57	−1.96	−1.73	−1.97	
ΔER	−7.85**[1]	−5.04**	−4.98**	−3.81**	−3.24*	I (1)
CAP	−2.57[1]	−2.99	−3.43*	−3.10	−3.03	
ΔCAP	−5.27**[1]	−4.07**	−4.26**	−4.14**	−5.18**	I (1)
			Italy			
EXP	−1.48[1]	−1.32	1.35	−1.51	−1.02	
ΔEXP	−7.54**[1]	−5.59**	−4.47**	−4.77**	−5.33**	I (1)
Y*	−1.84	−2.31[1]	−2.67	−2.16	−2.09	
ΔY*	−4.13**[1]	−3.34*	−3.83**	−3.79**	−3.32*	I (1)
ER	−2.36	−1.69	−2.46[1]	−2.83	−2.15	
ΔER	−6.83**[1]	−4.40**	−3.72**	−4.31**	−3.94**	I (1)
CAP	−3.71*[1]	−3.33	−3.13	−3.45	−2.89	
ΔCAP	−6.80**[1]	−6.02**	−4.92**	−5.38**	−4.85**	I (1)
			United Kingdom			
EXP	−1.80[1]	−1.47	−1.78	−1.39	−1.43	
ΔEXP	−8.19**[1]	−5.30**	−5.40**	−4.43**	−4.35**	I (1)
Y*	−1.95	−2.47[1]	−2.59	−2.14	−2.21	
ΔY*	−3.75**[1]	−3.37*	−3.90**	−3.58**	−3.43*	I (1)
ER	−4.03*[1]	−3.58*	−3.71*	−3.63*	−3.08	
ΔER	−7.68**[1]	−5.63**	−4.99**	−5.84**	−4.06**	I (0)
CAP	−3.14[1]	−3.01	−2.90	−2.74	−2.72	
ΔCAP	−5.77**[1]	−5.22**	−4.91**	−4.46**	−3.62**	I (1)

Table A1 (continued)

Variable[2]	Canada					
	ADF1	ADF2	ADF3	ADF4	ADF5	Degree of Integration
EXP	0.80[3]	0.69	0.34	0.32	0.24	
ΔEXP	−5.67**[3]	−3.48*	−3.02*	−2.60	−2.65	I (1)
Y*	−2.55[3]	−2.42	−3.00	−2.65	−2.49	
ΔY*	−4.71**[3]	−3.53**	−3.84**	−3.86**	−3.11*	I (1)
ER	−2.56[3]	−2.71	−2.85	−3.02	−2.92	
ΔER	−5.63**[3]	−4.41**	−3.73**	−3.66**	−3.56**	I (1)
CAP	−3.56*[3]	−3.76*	−3.53*	−2.90	−3.25	
ΔCAP	−4.16**	−4.24**	−4.84**	−3.92**	−4.67**[3]	I (0)

[1]Augmented Dickey-Fuller t-test. Regressions include a constant and (for levels) a linear time trend. ** and * indicate rejection of the unit root hypothesis at the 1% and 5% significance level, respectively, based on the critical values from Mc Kinnon (1990). — [2]Logs of the respective variables; Δ = first difference. — [3]First specification for which the hypothesis of white noise in the residuals cannot be rejected.